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ABSTRACT

A study investigated the effectiveness of self-instructional strategies in enhancing the word recognition skills of learning disabled elementary school children. Subjects were 30 students in learning disabilities resource rooms whose word recognition skills were at least one year below expectancy, as measured by a standardized reading test, and whose IQs were average. The students were randomly assigned to either a control group or an experimental group. Materials used with the experimental group incorporated components of D. Meichenbaum's self-instructional approach, as well as elements derived from psycholinguistic theory and research that emphasize a simultaneous multilevel skill approach to the teaching of reading and instructional approaches facilitating the development of strategies by children for discovering invariant structures or generalizations relating to phonological, syntactic, and semantic information. All students were administered a measure of word recognition skills, an informal reading inventory, and a reading comprehension measure as pretests and posttests. Results showed that students in the experimental group performed better than control group students on measures of word recognition and on the informal reading inventory. There was, however, no significant difference in the performance of the two groups on the reading comprehension measure. (FL)

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Enhancing Word Recognition Skills Among Learning Disabled Children by Means of Self-Instructional Training

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The need for efficient outcomes from teaching reading is as important now as it ever was. Gibson and Levin (1975) have stated that "as many as 25% of school children read more poorly than their grade levels would predict." Moreover, these failures are predictably "distributed unevenly in the population since the preponderance of failures occurs among poor children within urban schools." As these two researchers have concluded, "the economic and social consequences are obvious." (p. 4).

While the incidence of reading problems would seem to predominate among the poor in urban schools, these deficiencies are also heavily represented in other sectors of the school population. For illustration, in a study conducted by Bommarito (1976) at the laboratory school of Illinois State University, the average incidence of severe underachievement (two years or more below grade level on standardized reading tests) in reading among children with average or above average intelligence was approximately 13 percent. There is no reason to believe that

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less favorably endowed schools, like the customary public schools, would not have estimates as large or larger than these.

When we relate the problems of reading to the population of children with learning disability, there is no cause for assurance, as it is generally conceded that most children with learning disability are deficient in reading skills (Kaluger & Kolson, 1978, p. 3). Chall (1978) has been very adamant on this point, describing research which indicates that the major presenting problem for 75 percent of the children referred to the Learning Disability Clinic of the Children's Medical Center in Boston was a reading disability (pp. 40-41). Moreover, the lowest conservative estimate of learning disabled children in the schools is four percent, while some statistics claim that the incidence may be as high as 20 percent (Ross, 1976).

It follows, then, that the reading problems among school children are very extensive, but particularly among LD children, and that such children constitute a substantial proportion of the school-age population. The recent research in Peoria that Bommarito conducted (1978) indicated that no LD child in the 10-12 range, despite average intelligence, could begin to compare with the average score of randomly selected second grade children in very basic phonetic and word-recognition skills that are usually learned in the first two years of school. Unquestionably, the problems in reading among LD children are severe, particularly in word recognition skills at the elementary level.

The problems of children with learning disability (LD) may also be viewed from the vantage point of how we are to help them. In the last 10 years, the pendulum has swung from an emphasis on training underlying psychological processes (as visual perception, visual-motor

coordination, auditory-perceptual, etc.) to one of task analysis and direct teaching with a stress on language-oriented skills. Presentations at national meetings by specialists in learning disability (Schwartz & Sheff, 1979) and numerous publications (Ross, 1976, 1977; Hammill & Bartel, 1978; Kaluger & Kolson, 1978; Chall, 1978, and Bateman (in press, cited by Chall, 1978) support these conclusions.

Several sets of findings serve as the impetus for these changes in perspectives. First, no controlled research has supported the idea that training in underlying psychological processes is a prerequisite to improvement in academic achievement. There is simply no transfer effects between the two realms, Secondly, it is generally recognized that cognitive processes, such as selective attention (Ross, 1976, 1977) and reading skills are quite deficient among LD children and that these deficiencies strongly influence academic performance. Thirdly, as Chall (1978) has underscored, the data increasingly show that what is effective is direct teaching (pp. 34-35). Finally, at least some research described by Chall (1978) has indicated that with weaker academic groups, (as white boys, black children, and Puerto Ricans, as opposed to stronger groups, like white girls), the incidence of learning disability among competent teachers can be one-half the rate found among weaker teachers, even though the children "are lacking in 'basic psychological processes,' as determined by the extensive test battery" (p. 38). The last finding once again dramatizes the significance of effective direct teaching.

Despite the proliferation of reading problems of school-age children in general and LD students in particular, Gibson and Levine (1975) have contended that the preponderance of research in reading

has simply compared curricula. Very few research efforts have addressed themselves to the process of reading, which refers to how children learn how to read. Perhaps the most outstanding exemption to this omission of process is the notable research by Gibson and Levin themselves (1975). On the basis of their research covering more than 10 years of time, they have maintained that, contrary to associative stimulus-response theory, children learn how to read by differentiating distinctive features and invariant order. For example, the very young child can be taught to identify letters by distinguishing between round ones (as C and B) and those with triangles (as M, V, and W). To these researchers, motivation and reinforcement for cognitive learning do not have their origin in external events but are the result of the child's need for reduction of uncertainty. It is behavior which reduces uncertainty that is learned. According to the interpretation given by Ross (1976), in this sense, "perception is a self-regulated, active, and adaptive process" (p. 28).

In any event, the importance of such cognitive processes suggests to Gibson and Levine (1975) that, for a child, "growing awareness of potentially useful strategies and efficient self-monitoring of them is an impressive aspect of development -- it is as if he is becoming a little psychologist. Why not?" (p. 61).

Why not indeed! The research on psychological processes in reading by Gibson and Levine (1975) suggests therefore that instructional programs should seek to promote efficient strategies of perceptual search and detection of invariant order, generalizations or abstractions if you will. Such mediational strategies are particularly crucial for exceptional learners. On the basis of their review of the relevant

literature, Wittrock and Lumsdaine (1977) have inferred as follows: "The research implies that children with poor conceptual ability profit from instruction when the conceptual organization of the information is made explicit and is given to them. Of much interest are the data that children of poor conceptual ability can sometimes be taught to produce mediators and to use strategies that improve comprehension." Commenting on the significance of these findings for research, these authors concluded: "We need to experiment more with these important mediational methods" (p. 436).

In the pursuit of such experimentation, the use of self-instructional procedures are ideal. Not only do they subsume such strategies but also foster the development among children of self-awareness of these strategies as well as efficient self-monitoring procedures.

A renowned leader in this field (Meichenbaum, 1977) regards self-instruction as an example of cognitive behavioral management which he has defined as "an analysis of the thinking processes involved in the performance of a task rather than merely the assessment of the product or outcome of performance" (p. 13). Self-instruction (SI) is the process of using "inner speech" in task performance to regulate behavior. As described by Meichenbaum (1977) and used in his numerous research studies, it includes the following components and sequence:

1. Teacher (experimenter) performs the task while the child (subject) observes.
2. Child performs task while teacher instructs aloud.
3. Child performs task while instructing himself aloud (overtly).
4. Child performs task whispering.
5. Child performs task while instructing himself (covertly).

In addition, the SI incorporates features relating to self-reinforcement ("I'm doing fine"), self-evaluation ("is it a real word"), and appropriate reactions to error ("so I made a mistake, everyone does").

A whole host of investigators have systematically and extensively studied the clinical effects of SI training and other cognitive procedures. These have been reported at some length in the literature. (Rimm & Masters, 1979; Quay & Werry, 1979; Ross, 1976; Meichenbaum, 1977; Abikoff, 1979). As two of the most extensive reviews of the literature in this area indicated (Meichenbaum, 1977; Abikoff, 1979), the procedure shows much promise regarding its effectiveness with behavior problems and coping strategies among children. Some have also studied procedures enhancing academic skills in an indirect manner by reducing impulsive reactions or increasing attentional sets. However, in his review of cognitive methods for working with learning disabled children, Ross (1976, pp. 107-122) has reported that nearly all of the studies used psychological tests as the criterion of improvement. Very few studies have concerned themselves with the enhancement of academic skills in the content areas (Palincsar, 1980).

Two exceptions to this general trend are the studies by Bommarito and Leon. The former, under the supervision of Meichenbaum (1976), developed a clinical SI program to improve reading comprehension skills among severely deficient readers at the upper elementary and junior high levels. Similarly, Leon and Pepe (1978) did a controlled research study using SI procedures to improve computational skills in arithmetic among children classified as learning disabled or educable mentally handicapped in the 9-12 age range. Their results showed dramatic improvement for these children.

The present study was intended to extend the SI strategies (after Meichenbaum, 1977) to the enhancement of word recognition skills among LD children in the elementary grades. The main vehicle for this purpose was a series of prepared dialogues which not only incorporated the components of Meichenbaum's SI approach (1977) but also both the theory and research by psycholinguistics which emphasize the following: a simultaneous multilevel skill approach to the teaching of reading; and instructional approaches facilitating the development of strategies by children for discovering invariant structures or generalizations relating to phonological, syntactic, and semantic information (Gibson & Levin, 1975; Samuels et al., 1974; Ehri, 1978; Barron, 1978; and Feldman, 1978).

In the course of this investigation, the following three hypotheses were tested for differences between treatment and control groups:

1. There is no statistically significant difference in posttest scores on criterion-referenced scales measuring word recognition skills.

2. There is no significant difference on the instructional levels obtained from posttests of an informal reading inventory.

3. There is no significant difference in the posttest comprehension scores for a subscale of a standardized reading test.

Method

Scales used. The following tests were used to evaluate significant differences between the groups on posttest scores:

1. The first scale we utilized was the Kennedy Institute Phonics Test (revised experimental version) by Guthrie and Siefert (1974) of the International Reading Association. It is a criterion-referenced

phonics test of ten subscales, with 20 word items in each subtest. It covers the basic phoneme-grapheme skills children learn in the first two years of school. Recent research by Bommarito (1978) has demonstrated, however, that the average scores on these subscales by LD children within the age ranges in which we are interested ranked significantly below the average for randomly selected second grade children. Furthermore, except for the two subtests of letter sound production and letter naming, not a single LD child either attained mastery level on any subscale (85 percent) or the average for the second grade children. The respective averages for the LD children and the randomly selected second-grade children on these 20-item subscales were respectively eight and sixteen, or 40 percent vs. 80 percent ($p < .001$). Since the first five subtests of this scale measure supply skills and word recognition, they represent the highest level of abilities. It is the posttest scores on these subtests which we measured to check the first null hypothesis. Subscales six and seven (the sounds of letters and their names) already are mastered by the vast majority of all children; while subscales 8, 9, and 10 simply represent listening skills.

The equivalent form reliabilities on these subscales range between .83 for final letter recognition to .95 for consonant cluster recognition. Subtests one through seven must be administered individually. Subtests eight, nine, and ten, measuring listening skills, can be given on a group basis.

2. The second scale used was the Analytic Reading Inventory by Woods and Moe (1977). It is an informal reading inventory with many advantages. It has parallel forms, like the Kennedy test. It has

been carefully constructed over a two-year period, involving field testing and computer analysis of the graded reading patterns. Its standards for determining errors, as well as the instructional and independent levels, are in agreement with the best available criteria in the field of reading (Ekwall, 1976a; 1976b). Its definitive criteria for measuring levels, together with the multiple forms, give the examiners a firm basis for testing the limits of a child's skills. It can provide useful on-going diagnostic information to the teacher. For example, the student is required to perform a task similar to what he would do in classroom reading (read a passage and answer questions about it). As Ekwall (1977) has emphasized, such types of tests are needed for more accurate prescriptive teaching (p. 31). Finally, use of these scales permitted an evaluative analysis regarding the generalization of word-recognition skills to the improvement of abilities in reading comprehension. Also, this type of scale lends itself well to a test of the linguistic thesis that the proper focus of teaching reading should be an emphasis on meaningfulness from the start.

In short, the general methods followed for the construction of the test, its general features, and the dovetailing of these characteristics with the intended purposes of our research led us to concur that the scale had both content and construct validity.

3. Gates-McGinitie Reading Test. The Gates-MacGinitie Reading Test (second edition), as already indicated, was utilized as a second measure of transference of word recognition skills to the improvement of reading comprehension. Its apparent advantages included brevity of administration time (approximately 30 minutes), out-of-level norms,

and normative data for the administration of the test in October, February, and May. Since our subjects were older elementary age children with extremely low levels of skills and our study did not begin until the Spring, these last two advantages of the test, we surmised, were badly needed.

Kuder-Richardson Formula 20 reliabilities on the comprehension subtest ranged between .89 to .91 (MacGinitie et al, 1978, p. 60). When the senior author attempted to obtain data for alternate form reliabilities, which the teacher's manual had stated were available in a Technical Manual (MacGinitie, et al, 1978, p. 60), he was informed by the publisher that this manual was still in the process of completion.

Training and teaching approaches. The program was carried out in the classroom by four resource teachers of LD children, while the children of four similar special educators served as the control group. Initially, the children were randomly selected and assigned to a self-instructional (SI) or a control (C) group. Teachers chosen for the SI group simply had children who had been randomly assigned to the treatment. Three principal training procedures were utilized to help the four LD teachers in the SI group: a comprehensive teacher's manual, a half-day workshop, and supervisory visits.

The teacher's manual. The senior author developed a comprehensive teacher's manual as a model to follow for instructional purposes. The most essential features of this manual were as follows:

First, explicit dialogues for teaching word recognition skills via the basic paradigm for SI by Meichenbaum (1977), with specific applications of this model to the development of word recognition skills, comprised its core.

The basic SI program in these dialogues incorporated the use of context clues and the essential features of the hypothesis test training Samuels et al (1974) followed to teach word recognition skills to Educable Mentally Handicapped children with a mean age of 10.3. These researchers found their program to be quite effective in terms of increases in the recognition of words (on lists and in contexts). As Singer (1971) has declared, "by looking at the initial consonant and other parts of the word, the individual is employing a very powerful combination of word-recognition skills." As Wallen (1972) has described this minimum phonic-consonant approach, it is a method which "directs the pupil to use minimal sound clues plus context clues in order to read a word usually found to be familiar when spoken" (p. 43).

The element the SI approach added is to make the child acutely aware of this strategy so that it could become an active one in a perceptual search for structure. Thus, the use of consonant recognition and blending and context clues, with built in checks and double checks for self-evaluation of responses, served as the basic program (see dialogue in manual for context clues as an example).

As opposed to this partial program, linguists would propose that an ideal training program should try to teach three sets of skills or information simultaneously.

a. Graphic and phonological information. Graphic information refers to the shape of words, position of the letters in words, and features of letters in words. In this respect, the "beginning of the word provides more information for its identification than either middle or end. Knowing the beginning, the rest of the word is more

predictable." The end is the next most important element (Gibson & Levin, 1975, p. 198).

Phonological information refers to a spelling to sound correspondence. Both of these skills are incorporated in the basic program.

Other skills which may help the word recognition skills of reading in this respect are learning both intra-word relations, as in word families (phonograms), and word structures, as in compound words. These are incorporated in the present program and serve as the bulwark for its augmentation.

b. Ideally, the second kind of information desired pertains to syntactic or grammatical structure.

c. Finally, the third set is semantic constraints on meaningfulness. Emphasis on context sense incorporates these last two sets of skills.

Essentially, then, these dialogues incorporated the three kinds of information linguists would suggest for teaching reading by the use of context clues, consonant blending, word families, and compound words (as in tonight).

An example of a dialogue for the use of context clues which teachers modeled follows:

"Let's see now. What is it I'm supposed to do? I'm supposed to read the words aloud as well as I can. What if I come to a word I don't know? How do I figure it out? Well, I can look at the title. That may help. If not, I can read the words before and after the word. What if that doesn't work? Well, I can read enough about the story to see what it's all about. Whatever I do, the word I figure out should be a real word and it should make sense in the sentence. O.K. 'Let me at them'!"

The manual also employed shaping procedures in that it instructed the teachers to use the approaches gradually in the order mentioned and in a cumulative fashion (e.g., context clues, phonological clues, consonant blending, etc.). Finally, we outlined an integrative approach which suggested to the child that he use the clue most appropriate for the particular word recognition problem he encountered.

In addition to the dialogues, the second beneficial characteristic of the manual was a group of suggestions for teacher intervention when the child was struggling or missed appropriate clues for word recognition.

Other ingredients of the manual included a list of reading materials provided for their use, suggestions for continuous evaluations, a flow chart on the contemplated progress and sequence of the study, some background on the significance of the research, and rationales for the selection of the clues.

The workshop. The second chief training device was a full one-half day workshop by the two authors. Prior to the workshop, the manual had been forwarded to all of the LD teachers in the LD group. At this meeting, we discussed the rationale, procedures, objectives and materials of the study; demonstrated the procedures; and clarified, to the best of our knowledge, any questions or ambiguities held by the teachers.

Supervisory visits. Finally, teachers were provided with supervisory visits by one or the other investigator so that all of the teachers were seen by both authors. It should be reemphasized also that the instructional work was carried out strictly by the teachers with designated children in their classes. These instructional sessions consisted of two one-half hour periods per week over an eight

week span for a total teaching time of eight hours.

Subjects. Eligible criteria for this study included the following:

1. Membership in an LD resource room.
2. A chronological age between 8-11 or 12.
3. Essentially average IQ (85 or better).
4. A word recognition skill level or general grade equivalent on a standardized test of reading at least one year below expectancy level for the IQ scores.

On the basis of these criteria, an initial pool of children was developed. Children were randomly assigned to a control condition or the SI group from this initial pool, with 15 in each group.

In the gender and age distribution of these children according to the data made available to us by the schools, 21 were boys and 9 were girls. Within the SI group, nine were boys and six were girls. In the C group, there were 12 boys and three girls. In chronological age (CA), the range with the SI group (n = 13) was from 7-4 (one child only) to 10-9, with a mean of 9-6. In the C group (n = 14), the range was from 8-8 to 10-10 with a mean of 9-8. For the total group, the mean CA was 9-7. Ages were calculated according to the time the study began.

Before we even began the study, we calculated a t-test for significant differences in mean ages between the two groups ($\bar{X}$ of 9-8 for the C group, $\bar{X}$ of 9-6 for the SI group). With the demonstration of a significant difference in chronological age between the two groups, it would have become very difficult indeed to interpret findings. The t-test yielded a value of .69 (df = 25, $p \geq .20$). Thus, the differences in mean ages were quite insignificant and could

be interpreted as due strictly to chance.

Finally, the point needs to be made that, due to circumstances beyond everyone's control, it was not always possible to test all of the children on both the pretests and posttests. The analysis of the data thus pertained only to the children who were available for both assessment sessions.

Evaluation. Responsibility for the pretesting and posttesting was shared equally by the two investigators. The Gates-MacGinitie test was administered on a group basis. The other two scales were individually administered. Analysis of the data was completed, for the most part, by the senior investigator.

Finally, the purposes of evaluation, the scores of the two investigators for each group were compiled into one set of data.

Results

Our analysis of the results concentrated essentially on two types of data: (1) crucial pretest differences which could significantly complicate the analysis of posttest scores, and (2) an evaluation of posttest scores to verify or refute the null hypotheses.

Analysis of Pretest Scores

This analysis pertained to a check on differences in IQ scores and in the dependent variables--the three achievement tests used, the Kennedy Scale, the Woods-Moe Informal Reading Inventory, and the comprehension subscale of the Gates-MacGinitie Reading Achievement Test. The data were as follows:

1. IQ differences. If the two groups had demonstrated statistically significant differences on IQ scores, it would have been very difficult

to conduct any research at all, as differences in the dependent variables, the achievement test scores, could always be attributed to differences in learning ability rates; as Table 1 shows, the respective mean IQ scores of the two groups, 87·64 vs. 85·57, were very similar and strictly due to chance. Consequently, we felt secure in concluding

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Insert Table 1 here.

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that whatever differences occurred on the dependent measures could not be attributed to group contrasts in "learning ability."

2. Pretest scores on tests through five (T1-T5) on the Kennedy Individual Phonics Test (KIPT). Since the reproductive sound skills of subscales one through five most closely resembled the skills taught in the training program of the study, the analysis of pretest differences centered on these results. As Table 2 shows, though the mean for these scores somewhat favored the self-instructional group, the difference was miniscule.

Insert Table 2 here.

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3. Woods-Moe Informal Reading Inventory. Form B of the Inventory was administered as a pretest; Form C as the posttest. On both the pretest and posttest, students who were unable to attain at least a Primer Instructional Level were classified as a preprimer reader. The children were then grouped into two classes of reading levels: primer or preprimer, or grade one and above. As Table 3 demonstrates, the probability of chance differences was indeed high, better than

80 percent. We can assume therefore that the two groups were quite equivalent in instructional levels, as measured by the Woods-Moe Reading Inventory.

Insert Table 3 about here.

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4. Pretest scores on the Gates-MacGinitie Reading Test. Originally, we selected this test as a measuring device for three reasons. First, it served as a second test to evaluate the transfer of improved word recognition skills to improvements in reading comprehension, the first being the Informal Reading Inventory. Secondly, we could select the form that matched the word recognition grade equivalent levels the students had attained on the reading tests the teachers had previously administered (usually the Peabody Individually Administered Achievement Test or the Woodcock Reading Scale). Thirdly, as already shown, the scale has dual advantages concerning normative data with respect to out-of-level tests and normative data for several test times within the school year. As Table 4 shows, the mean raw scores of the two groups were essentially the same on the pretests.

Insert Table 4 about here.

In summary, analyses of pretest scores indicated that no significant differences existed between the SI and control groups on IQ scores, chronological age, or any of the dependent variables.

With the elimination of any crucial differences between the two

groups on IQ measures, age, and scores in the dependent variables, we could proceed to check the null hypotheses with greater assurance than would otherwise have been the case.

Checks on the Null Hypotheses

In review, the three null hypotheses posed at the beginning of the study were as follows:

1. There is no statistically significant difference in posttest scores on criterion-referenced scales measuring word recognition skills. Form F of the KIPT was the scale selected to check this hypothesis. Form C had been administered as a pretest. More specifically, we selected subscales one through five to measure this growth because these scales measure the production of word recognition skills, the ability the study was designed to promote. Subscales six and seven respectively included checks on letter sounds and letter naming, skills all or nearly all the children had already mastered (the average for each group was over 90% for each subscale). Similarly, subtests eight, nine, and ten measured listening skills, a set of abilities not promoted by the study. As expected, the posttest means for the totals on these three scales for the SI and control groups were nearly identical with respective means of 52.7 and 51.9 ($t = .25$, $p > .20$).

The statistic applied to measure posttest differences on T1-T5 scores on the KIPT took into account the pretest differences for the two groups. The analysis of co-variance yielded an F value of 4.74 ($p < .05$). The adjusted posttest means, the original posttest means, and other relevant data of Ancova are embodied in Table V. The extremely large F-value would lead us to reject the first null

hypothesis. We can only conclude that the differences in posttest scores did indeed favor the SI Group.

Insert Table 5 about here.

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2. There is no significant difference on the instructional levels obtained from posttest scores on an Informal Reading Inventory.

The scale used to measure these data was Form C of the Woods-Moe Informal Reading Inventory. Form B had been administered as a pretest. As the pretest classifications had indicated, the initial differences in instructional levels on this scale were so minute that the probability of chance results was over 80 percent. For this reason, it is probable that posttest differences on this scale in the instructional levels attained represented true gains.

Two types of measures were designed to measure these differences in instructional levels attained on the posttest scores of the Woods-Moe Scale. First, we applied a t-test on the differences between the two groups for the number of children who showed extreme shifts upwards of two or more levels. Five in the SI or E group ($n = 13$) and only one child in the Control group ($n = 15$) demonstrated such radical improvement. For example, a shift in one grade level would be from preprimer to primer levels. An upward shift of two levels would be from preprimer to first grade. A t of 2.13 indicated that the chance probability of such an extreme difference in an upward percentage shift (38% to 7%) was less than five percent ($p < .05$). These data are summarized in Table 7.

Insert Table 7 here.

Since so many of the children from both groups were at the primer or preprimer instructional levels on the pretest (see Table 3), we also attempted to check for a significant difference in the percentage of children who had shifted on the posttest from these very rudimentary skills to an instructional level of first grade or better. At least some educators believe that a formal reading curriculum cannot be taught to a child unless his minimal achievement is at the beginning first grade. For this reason, the significance of this statistic should be clear. As Table 8 illustrates, twice as many children in the SI group as in the C group obtained such a shift and a t-test indicates that the percentage change such numbers represented was statistically significant ($p < .05$).

Insert Table 8 here.

In short, two t-tests indicate that we can also reject the second null hypothesis. We can conclude therefore that highly significant differences in the instructional levels of the posttest scores for the Informal Reading Inventory favored the Self Instructional (SI) group.

3. There is no significant difference in the posttest comprehension scores for a parallel subscale of a standardized reading test. In this evaluation, the Gates-MacGinitie Reading Test was the measure of choice. As Table 9 on the mean raw scores of the two groups proves, the null hypothesis was supported in this instance, a finding which was not at all surprising to the investigators for reasons explained in the discussion.

Insert Table 9 about here.

Discussion

In our estimation, the most outstanding outcome of the study was to obtain the significant results indicated after an extremely brief instructional period of eight hours. Taken together, the findings on the KIPT and the Informal Reading Inventory (The Woods-Moe) give much encouragement to the further pursuit in the use of SI procedures for teaching reading skills to LD children at the elementary level. Furthermore, the improvement on the IRI in instructional levels suggested that systematic SI instruction in recognition of words in a passage had a generalization effect for the improvement of comprehension. Instructional levels are determined by, it will be recalled, the dual criteria of word fluency and comprehension levels.

As this paper has documented, the need for reading skill improvement among LD children of this age level is indeed crucial because of the very large incidence of reading disability so prevalent in this group.

Clinical qualitative findings lend additional support to the feasibility of undertaking additional research in this area. For example, one child in the SI group "jumped" three instructional levels from primer to third grade level. Several others progressed two grade levels. No child in the Control (C) group reached either of these drastic change criteria on the IRI.

We realize, of course, that some reading experts have severely criticized informal reading inventories on a number of methodological grounds, one of the most crucial ones being a lack of reported reliabilities,

(e.g., Spache, 1976). Other experts, however, believe them to be ideally suited for prescriptive teaching (Ekwall, 1976a, 1976b). Moreover, as our previous description of the Woods-Moe Reading Inventory indicated, it certainly had considerable care in its construction. Also, it fitted the purposes of our instructional aims which was to teach the child to think before responding, consider alternatives, evaluate his work, react matter of factly to error, and, above all, "to take his time." In our opinion, no standardized test of reading comprehension meets all of these goals.

In retrospect, we made a serious error in the selection of the Gates-MacGinitie Reading Scale as a dependent measure. The scale not only has all the pitfalls of all standardized tests in terms of measuring the goals of SI instruction in reading but it also presented an additional glaring deficiency. The comprehension subtest on the forms suitable for the very low levels of achievement among our LD subjects relied principally on picture clues for the deciphering of meaning, a skill which was not in the least emphasized during the study. In any case, the severe restrictions on timing and the highly questionable curricular validity of many standardized reading tests, as trenchantly illustrated by recent research (Jenkins & Pany, 1978), make them questionable tools for the evaluation of reading progress under SI programs.

For these reasons, we would suggest that SI research in the future, whenever possible, use criterion-referenced tests in comprehension for the evaluation of progress. At the very least, an extremely careful selection of standardized tests is required. In our case we can only weakly say that "haste makes waste." Since we had considerable

difficulty at first in finding a cooperative school district who would participate in our research, by the time we did discover "our friends" we had to act hastily to find the second evaluative instrument to test generalization of comprehension from instruction in word recognition skills.

At this point, we would like to underscore two general but very pervasive precautions. First, no child in the SI group became a proficient reader, though the one child who progressed three grade levels came very close to appropriate expectations. With all of the other children, the instructional levels were at the second grade level or less, representing severe reading deficiencies indeed. KIPT scores also reflected the continuance of severe deficiency in reading. Since mastery on any subtest of this scale is 85 percent, the approximate average of 50 percent obtained by the SI group on the posttest can hardly be said to demonstrate proficiency in word recognition skills. Considering the short instructional period involved, the lack of "true proficiency" in reading skills among such a group is to be totally expected.

Secondly, we would caution against concluding that no learning in the C group took place. As Ross (1976) so carefully stressed, when an investigator rejects the null hypothesis regarding differences between pretest and posttest scores, he can certainly conclude that learning has occurred. At the same time, ". . . when no difference emerges -- when the null hypothesis cannot be rejected -- the obverse conclusion, that no learning has taken place, is not justified" (p. 6).

In our case, we can therefore conclude that <u>more</u> learning occurred in the SI group than in the C group at levels than could ordinarily

be attributable to chance. Still, as Table VII clearly indicates, growth for the C group as a whole on the KIPT did occur at a level beyond chance. As Table 6 amply demonstrates, within group comparisons again favor the SI group with respect to statistically significant levels and the sheer size of the differences between posttest and pretest scores.

Insert Table 6 about here.

Insert Table 7 about here.

Intertable comparisons for Tables 6 and 7 may be made more intelligible by the acceptance of two generalizations. First, both groups of teachers worked with their children several times a week over the eight week interval of the study, using their own approaches exclusive of the SI procedure. Accordingly, growth should have been expected to occur. Under these conditions, one-tailed tests in which the expected direction of change is predicted are entirely acceptable. Secondly, with novel or largely untried procedures, probabilities of finding between .05 and .10 may be regarded as significant. Viewed in this light, a qualitative comparison between the experimental (SI) and control (C) groups or the posttest scores on the KIPT largely favors the former for the group as a whole and for the majority of the teachers.

A third precaution we would hastily add is that we are very modest in our claims for the significance of the study, inasmuch as we did not eliminate the many drawbacks of SI studies applied to LD children

as delineated by scholars. As outlined by Palincsar (1980, pp. 15-19), for example, these include small groups, gender, the brief duration of treatment, failure of data to show maintenance of results, the failure to promote generalization within the treatment itself, the relative growth of low and high IQ subjects, and possibly isolation of the relative importance of the treatment components, notably instructions, self-instruction, cognitive modeling, shaping, prompting, reinforcement, and fading.

In several respects, however, the study did circumvent objections to previous SI studies with LD children.

1. As Ross (1976) has stressed in his review of the research on cognitive methods with LD children (pp. 107-122), the majority of the studies used psychological tests as the criterion of improvement. As Ross (1976, p. 122) also emphasized, it is very difficult for teachers to determine the meaning of such data for classroom performance.

2. As Palincsar pointedly stated (1980), most studies have utilized rather rigid selection criteria, consisting of above or below median scores on the Kagan Matching Familiar Figures Test (1964). The present study used multiple criteria for the selection of the children to be included in the study.

3. Finally, in her review of the research for SI studies with children who have learning problems, the comment by Palincsar (1980) probably represents the most severe criticism of all concerning these investigations insofar as the classroom is concerned: "The studies were limited to controlled experimental situations. To fully explore the potential usefulness of self-instruction, focus must be directed to academic skills such as reading and math where generalization can

be more readily promoted to the natural environment--the classroom" (pp. 23-24). The present study obviated this criticism in two respects. First, it dealt directly with the crucial academic skill of word recognition. Secondly, it utilized the services of teachers to apply the SI procedure within their own classrooms.

In review, the results of this exploratory study are highly encouraging. Doubtlessly, the study needs replication to eliminate the many criticisms directed against SI studies in general, to utilize more effective criterion measure of growth, and to streamline the efficiency of the SI approach within the classroom setting as applied to the promotion of reading skills.

As the last sectors of this paper, we would like to discuss three interrelated matters relating to the potential improvement of further research: the possible reasons for the effectiveness of SI training, suggestions for future research, and some final comments.

Possible Reason for the Effectiveness of SI

In her excellent paper evaluating the merits of an SI approach for LD children, Palincsar (1980) suggested that its effectiveness can possibly be attributed to the fact that the verbalizations modeled are directed to several relevant performance skills:

"*1. problem definition

*2. focusing attention to task

*3. response guidance

*4. self-reinforcement

*5. self-evaluative coping and error correction . . . "

She illustrated these components in a task by the example of a hypothetical teacher who was to have a child copy his name from a

model. In this instance, the verbalizations the teacher models might be as follows. It should be noted that the number of each item corresponds to the number of the crucial component in the SI model listed previously.

"O.K., what is it I have to do? I have to print these letters on my paper so that they look just like this.*1 I have to take my time and be careful. O.K., the letter 'L' first.*2 Draw the line down and to the right. The 'i' starts in the middle here and goes down.*3 Good! I'm doing fine so far.*4 Now the 'z.' No--I was supposed to go the other way. Well, that's O.K.--just erase carefully and try again. Everyone makes mistakes.*5 O.K. Finished. I did it!" (p. 3).

Elaborating on possible reasons for the effectiveness of SI for aiding children, Palincsar (1980, pp. 5-6) has also carefully described, in some detail, the close relationship between the stages of operational learning espoused by social-learning theorists and SI (Guralnick, 1976), as well as the parallel components between the verbalizations used in SI and the criteria for problem-solving strategies, such as D'Zurilla and Goldfried (1971) have developed.

Finally, Palincsar (1980) has summarized the process of self-instruction (SI) as a process of "applying modeling, overt fading to covert rehearsal (language), feedback, and social reinforcement to the specific demands of an analyzed task" (p. 7).

Suggestions for Future Research

The use of SI in the classroom really opens Pandora's box. As a result, we hardly know where to begin because the possibilities are endless. What we hope this study has done, if nothing else, is to

support the notion that further research endeavors are fruitful to undertake. As a means of guiding responses in this area we would suggest three lines of inquiry: (1) some general theoretical and pragmatic considerations, (2) specific research desiderata applicable to the classroom, and (3) additional notions offered by scholars in the field which "beg" for consideration.

General theoretical and pragmatic considerations. We make no pretense of covering all possible issues here. Nonetheless, we would strongly urge "would-be" researchers in the use of SI procedures for clinical and educational interventions to consider very carefully the following broad topics.

1. No one can hardly argue with the logic and validity of the position which urges the isolation of antecedent variables affecting outcomes in research stressing clinical or educational intervention. But an argument might ensue as to the appropriate timing for introducing such isolation of independent variables. According to Azrin's (1978) excellent treatise on research, in clinical intervention research, a category in which we would place SI studies in the classroom, the foremost goal should be the development of a clinical intervention package. Only after the researcher is satisfied that such a package has been fully developed should he attempt to isolate independent variables in any comprehensive manner. We would offer the conclusion that we "have a long way to go" yet before we can reach such satisfaction. Consequently, we would strongly urge that research efforts, at least in the immediate future, should be directed to the development of a clinical intervention package.

2. In aiding children with learning problems, Ross (1976) has underscored the point that the foremost question should be as follows: "How does the child learn and how can she best be taught?" In his estimation, "the best way of answering it is by teaching her something under controlled conditions, using a variety of formats and comparing their effectiveness" (p. 10). Some researchers, like Stevenson (1972) would call this procedure diagnostic testing. Other researchers who have developed extensive research programs on this procedure have named it "process testing" (Haywood, 1975; Feuerstein et al, 1979; Feuerstein et al, 1980). We would heartily concur with Ross (1976) that this method "is far more productive of a child's later school achievement than any existing tests which are purported to identify LD children" (p. 10).

We firmly believe that SI fits into this matrix of process testing. For example, at some distant point we would like to develop a profile of children and/or problems which would receive maximum benefits from SI training as opposed to some other form of instruction.

3. The authors are very sensitive to the criticism of SI studies that they not only fail to check transfer effects but do not weave such generalization effects into their treatment. The significance of such effects is unquestionable. As Ross (1976) has stated, "the importance of transfer should be a central goal of all teaching, for it is not enough to have a child recall certain facts in a classroom; he must be able to recall them away from school or in different classrooms and in different contexts." At the same time, he has also emphasized that we facilitate transfer effects "by having the child use a given piece of information and skill under a variety of

conditions during the initial teaching process" (pp. 18-19).

The contention of the present investigators is that SI training includes these conditions facilitating transfer effects. As illustrative support for this conclusion, the comments by Palincsar (1980) on the implications of SI for educators serve as a case in point. As she has stated, translated into instructional terms, training in SI presents some exciting possibilities. "Rather, than addressing isolated skills such as memory or visual discrimination, children would be engaged in activities which would teach them to learn." Citing research data reported in Berkowski and Cavanaugh (1979), as the prevalent opinion of researchers, she stated that such investigators believe that "there has been a failure to provide children with efficient learning cues--cues which promote semantic analyses. Self-instruction (SI) fosters this kind of instruction. Children are encouraged to engage in internal dialogues which will facilitate planning, proposing alternative decision making, and coping skills. The child becomes an active participant in the learning process engaged in both satisfying demands and manipulating the environment to enhance learning" (pp. 25-26).

4. As we have already made clear, linguists believe in teaching reading with meaning from the start. In other words, they recommend a multi-level method of teaching several reading skills simultaneously. This philosophy would seem to imply that the teaching of phonics and context clues at the same time are not incompatible. The implications of such compatibility for teaching purposes has been succintly expressed by Ross (1976): "As soon as the child has learned a few grapheme-phoneme combinations, these can be combined into simple words which, in turn, can be used in the context of meaningful sentences (higher-order

structure)" (p. 156).

Patently, this outlook on the appropriate method of teaching reading skills directed our SI dialogues. We would suggest that future research carefully inculcate this methodology within their SI approach. It has much to recommend itself.

5. We contend that at some later point in time researchers must consider the individualization of teaching reading skills in the SI research design for the methodology involved and for the possible inclusion of children to participate in the study. The hierarchy of skills in reading underscores the importance of considering such individualization in the research effort.

Based on Wiener and Cramer's model (1967), Ross (1976) has conceptualized the hierarchy of skills, proceeding from most advanced to most rudimentary, as follows:

"Comprehension

Decoding

Discrimination

Sequential Scanning

Selective Attention" (p. 144).

Since it is possible that LD children are able to sustain attention but have difficulty at one of the higher levels in the hierarchy, "careful study of each individual child is necessary if one is to ascertain the specific nature of the problem and decide on the problem and decide on the kind of remedial help needed." However, since skills at the lower levels represent necessary conditions for effective reading, investigators should rule out the possibility of inadequate skills

at the lowest rungs of the skill hierarchy before proceeding to explore skill adequacies at the higher levels (Ross, 1976, p. 154).

Ideally, beyond the content of skills to be learned by the child, individualization should also occur for the SI strategies themselves, based on an assessment of the child's level of skill in this crucial area (Asarnow and Meichenbaum, 1977).

In addition to the individualization of instruction relating to the hierarchy of reading skills and the assessment of SI capabilities, the tailoring of such methods should consider motivational problems. Citing research showing that reading comprehension has been brought up to grade level among some children simply by providing them with praise and money for correct answers, Ross (1976) has stated that comprehension "is not likely to develop without training if a child has defective comprehension." Consequently, he has suggested that what really occurs in the absence of training is merely an improvement of the child's motivation to emit responses (p. 163). Two immediate questions for SI research immediately arise. Should such children be eliminated from SI studies? If so, how do we identify students with poor motivation to learn?

Still another topic of considerable importance for the individualization of instruction and hence the tailoring of research in SI to meet the needs of children is the interference of incidental learning with progress in reading. Incidental learning, as described by Ross (1976), refers to learning gained by focusing attention to a wide range of stimuli, rather than those needed for successful task solution (selective attention). Obviously, incidental learning interferes with selective

attention. In this connection, Ross (1976) has posed the possibility that "poor readers are developmentally retarded and like young children show more incidental learning." As he has commented: "This question begs for investigation" (pp. 33-34).

Specific Research Suggestions for the Classroom: In order to reduce the number of drawbacks associated with this study on teaching reading skills, as well as those of other SI research studies in the classroom, we would recommend that the following be considered:

1. Larger groups.

2. Longer instructional periods. For this purpose, a full semester of teaching would be ideal, as Singer (1971) has urged.

3. Longer inservice training sessions for teachers.

4. Better criterion-measures of progress with a particular emphasis on criterion-referenced tests on reading comprehension.

5. Streamlined dialogues.

6. More initial feedback from teachers regarding the vocabulary and nature of the dialogues, perhaps from the children also.

7. Exercises, much in the manner described by Samuels et al (1974) that literally "force" the child to use certain kinds of clues. Such a procedure readily lends itself to the processes of shaping, prompting, and fading.

8. Some checks on the maintenance of skills. When such checks occur, however, intermittent reimbursement in the SI approach should be "part and parcel" of the treatment in the research plan. Research described by Ross (1976) supports the crucial nature of this component of treatment. Thus, in the study by Egeland (1974), children who had been trained to use more adaptive attentional strategies by cognitive

methods "reverted to the compulsive mode of responding when they encountered more difficult problems and appeared to anticipate failure." As Ross (1976, p. 120) has concluded, the implication is "that the newly learned reflective response style was still too tenuous and that further training under conditions of intermittent reinforcement might have made it more resistant to extinction."

9. Though the procedures have rarely been tried with SI approaches in the past, there is no reason why reversal procedures, contrasting treatment methods, multiple baselines, and other types of idiographic research so prevalent in traditional behavioral design research could not apply to SI investigations.

Research suggestions by scholars. Palinczar (1980) has done an excellent job of consolidating suggestive lines of inquiry based on the research extant in SI today. Her recommendations pertain to general matters and to potential methods for developing the most efficient way to train children with SI procedures. With regard to the first matter, she would have research workers address their efforts to three questions:

"1. What is the level of skill acquisition as a determinant in the value of self-instruction?" Few researchers have studied this independent variable.

"2. What is the comparative nature of 'self-talk' between children with learning problems and 'normal' children of school age? Nothing in the literature, for example, has specified the extent to which children with learning problems use fewer coping statements and appraise their work as less adequate than that of another learner."

3. Cognitive behaviorists generally identify four processings for establishing behavior: "shaping, direct instruction, modeling, and guided participation." SI essentially incorporates all four of these approaches. What are the relevant benefits of each?

With regard to the second broad research focus, the most effective way to train a person in SI, the potential methods, as envisioned by Palincsar (1980), include the following:

1. Classroom modeling and overt verbalizations by the teacher while the child monitors his own verbalizations.

2. Programmed instruction.

3. Video-taped presentations to small groups or direct intervention.

Similarly, "how important is it that self-instruction be individualized so that more than mere mimicry of the model is occurring" (pp. 26-27).

Final Comments

Ross (1976) has suggested that the possibility of designating a child as learning-disabled should only occur when she "fails to learn under conditions where other children of her age, intelligence, background, and capacity are able to learn . . . " The indication, then, is that "learning should occur under circumstances involving an appropriate match between teaching and training efforts and the child's capacity to benefit from them" (p. 7).

Certainly, SI training can expand the armamentarium of a special educator's clinical teaching skills and thus increase the frequency of such a match, thereby reducing the incidence of children suffering from teaching disability.

Special educators are also acutely aware of the task of specific pinpoints in the broad categories used in special education (Hewett, 1973).

Among themselves, such workers facetiously refer to LD as "lousy diagnosis." If we are to improve the efficiency of our diagnoses in LD, a number of interrelated possibilities are open to us.

1. We can more heavily emphasize the process testing previously described rather than dwell on assessing what a child has learned (product testing).

2. We can individualize our teaching approach by relating the child's learning needs in reading to his predominant failure on the hierarchy of reading skills.

3. We can follow the lead by Ross (1976) who urges that we should be able to identify subcategories within the area of learning disability. Our aim should be "to make general statements about what educational approach is best for children in a given group." It is apparent by now--a position this paper has repeatedly emphasized--that one such category is reading problems. As the classic text on learning disability by Ross (1976) has reiterated repeatedly, selective attention is also highly suspected to be very prevalent among LD children. In the absence of abilities in selective attention, Ross (1976) has affirmed that children are unable to learn. At the same time, Ross (1976) has also raised the possibility that attention to a number of irrelevant stimuli for the successful completion of a particular task (incidental learning) could conceivably be a major problem among poor readers and contribute to failures in selective attention. At least some preliminary research evidence suggests this possibility.

The need for prescriptive diagnoses, individualization of instruction, and subcategories are manifestly interrelated. We cannot individualize instruction without prescriptive diagnoses and the development of

subcategories facilitates both processes.

In the final analysis, many of these issues underscore the cruciality of a deductive approach for the advancement of knowledge in the field of learning disability. Ross (1976) has addressed the crucial need of such development most forcefully:

In his view, much of the difficulty with the learning disability field "would seem to stem from the fact that those who attempted to contribute to it have used an inductive approach, reasoning from an individual case to the entire group." In the course of these speculations for this large inferential gap, "they have looked for analogies from the brain-damaged, the mentally retarded, the deaf, the cerebral palsied, and their results have been largely unproductive."

Ross (1976) has reasoned therefore that a deductive approach would be much more promising. This approach emphasizes the discovery of "empirically based general principles that hold true for the group and to reason from these to the practicing case. To know about learning disabled children, one must study the processes of learning and the learning processes of the kinds of children about whom one is concerned. Nothing else will do" (p. 14).

It is the discovery of such empirically based principles that should be the ultimate goal for researchers in the field of learning disability.

At this juncture, we cannot resist reemphasizing what we consider a basic underlying tenet to guide the instructional efforts of teachers working with LD children. Again, Ross (1976), in his usual inimitable way, has expressed the matter very pointedly: "If the goal is to teach a child to read, teach reading and the subskills directly

relevant to it. The goal is not improved performance on a test of spatial relations or auditory association; the goal is getting the child to read. Nobody ever learned to read by balancing on a walking beam" (p. 168).

In conclusion, Palincsar (1980, p. 27) has reported "that the self-talk used in reports about cognitive behavior management has led to an abundance of interesting but loosely defined research . . . " Essentially, "there have been entirely too many 'what I think' papers and a paucity of 'what I found' papers."

She points to the studies by Bommarito and Meichenbaum (1976) and Leon and Pepe (1978) as signaling a new trend in applied study. Hopefully, we have bolstered this trend by the present investigation. As the suggestions for research we have outlined indicate, the possibilities for such applications are not only limitless but are sorely needed. We most readily concur with Palincsar (1980) that "theoretically, self-instruction and the constructs of cognitive behavior modification management suggest a powerful approach to helping the child with learning problems." Again, we most readily support her position that "we have miles to go in meeting the needs of our children" (p. 27). We have hardly begun to "scratch the surface." At least, however, we are beginning to have an idea of which surface we should scratch. Let's "dig in" and begin the job in earnest within the applied field. We trust that our contribution to this effort is a "step in the right direction."

Summary

The significance concerning the goals and content of the present research is underscored by the following factors: (1) the widespread prevalence of reading problems among the general school-age population; (2) the high incidence of reading problems among children classified as learning-disabled (LD), particularly rudimentary word recognition skills at the elementary level; (3) the documentary weight of evidence resulting in an instructional shift among LD children from an emphasis on underlying psychological processes to one of task analysis focusing on direct teaching of academic skills, especially those with a language orientation; (4) extensive research on the process of reading highlighting the significance of mediational processes and awareness of these processes for the promotion of reading skills; (5) research indicating the importance of explicit mediational strategies to promote learning among exceptional learners with poor conceptual skills; and (6) evidence from research supporting both the general and specific elements within the SI paradigm this study employed.

As we have already indicated, SI has much promise to promote mediational strategies among LD children for improving academic skills. But previous investigations with SI to promote learning among exceptional children have primarily used psychological test data as the criterion for improvement. The special educator would find it very difficult to translate such information into implications for direct instruction. Few SI studies, moreover, have been applied to the promotion of academic skills in the content areas.

Studies by the present authors represent the few exceptions to this criticism. The present study, then, attempted to extend our

previous work by applying SI to improve word recognition skills among LD children at the elementary levels in the 8-11 age range.

In the design of the research, children were randomly selected and assigned to SI and control (C) groups, with 15 students in each group. Each group of 15 children was distributed among four resource teachers in learning disability. The study was conducted by four LD teachers in their own classrooms with selective children. Teaching time covered two weekly one-half hour sessions over an eight week period for a total of eight instructional hours.

The principal training components for the teachers were a manual with comprehensive and explicit directions for the conduct of the research and teaching strategies, a half-day workshop, and weekly supervisory visits by the investigators.

The progress of the children in reading was evaluated by differences in pretest and posttest scores on a criterion-referenced word recognition test (KIPT), an informal reading inventory assessing word fluency and comprehension, (Woods-Moe Reading Inventory), and a subtest on comprehension from a standardized reading test (Gates-MacGinitie).

Our first major analysis of the data indicated that experimental and control group did not differ significantly in IQ scores, age, or in any of the dependent measures, a finding which gives some assurance that whatever superiority the SI group demonstrated represented true learning.

The second major evaluative task was to scrutinize differences in the dependent variables. In this case, the data indicated statistically significant gains on the KIPT and the Informal Reading Inventory favoring the SI group. But the null hypothesis was upheld for the

posttest differences on the raw scores of the Gates-MacGinitie comprehension subtest, a finding which was quite expected since the scale did not measure the thrust of the research effort.

Considering the relative brevity of the instructional period and the exploratory nature of the research, the results were quite gratifying to the investigators. We realize that the study suffers from many of the prevalent drawbacks associated with previous SI research but it also circumvented some of these charges. In any case, we believe that the results are sufficiently encouraging to pursue further research efforts in SI training to promote reading skills among LD children.

In conducting future studies with SI training for LD children in reading, or any other academic skill, we discussed at length considerations for three major intertwined areas: possible reasons for the effectiveness of SI procedures, suggestions for the improvement of research, and final comments.

With regard to our recommendations for research, we outlined general theoretical and pragmatic considerations and desirable components for work in the classroom. In our final comments, we dwelled on additional pervasive notions offered by scholars, such as emphases on direct teaching, incidental learning and selective attention as problems among poor readers, and the need for a deductive approach to guide our efforts in research. We discussed these matters in some detail.

In conclusion, we feel like we have opened up a "can of worms." All kinds of questions demand careful research inquiries. While we hardly regard SI to be a "polished" and completed method of clinical intervention, especially with regard to aiding LD children improve

their reading skills, it shows much promise but has previously lacked any substantial data in applied classroom work with LD children. The present study, at least, offers some badly needed empirical evidence in this direction.

All in all, the overall picture of SI and the constructs of cognitive behavior modification suggest a powerful approach for helping the child with learning problems. We believe, moreover, that is ideally suited for the development of self-control skills among children which behaviorists consider to be the ultimate goal for behavioral change (e.g., see Quay & Werry, 1979; Rimm & Masters, 1979). In any case, the preliminary evidence for this type of movement among children via SI, while not staggering, is encouraging. We would like to believe that we have played no small part in these beginnings. But these small tentative efforts are only beginnings. We still have many "eons of light" to go for helping exceptional children effectively. Let us begin our task in earnest.

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Table 1

t test for Significant Differences in I.Q. Scores Between SI and C Groups

Group	N	X	S.D.	df	t-value
SI	14	87.64	10.9	26	.47*
C	14	85.57	11.98		

*$p > .20$, N.S.

Table 2

t test for Significant Differences on Raw Pretest Scores of KIPT for T1-T5

Group	N	$\bar{X}$	S.D.	df	t-value*
E	14	35.79	10.53	27	1.53
C	15	33.35	8.52		
Totals	29				

*$p > .20$, N.S.

Table 3

Significance of a Difference Between Percentages -- A Comparison of Pretest Scores on the Informal Reading Inventory (IRI)

Group	**I.L. Primer (P) or Preprimer (PP)	I.L. Grade One Plus	N
C	12(80%)	3(20%)	15
E	10(77%)	3(23%)*	13

*The t-value of .2 for the difference of three percentage points could have occurred by chance more than 80% of the time.

**I.L. = Instructional Level

Table 4

t test for Differences in Raw Scores on the Pretest Session of the Gates-MacGinitie Reading Test

Group	N	$\bar{X}$	S.D.	df	t
E	14	19.82	6.21	26	.91*
C	14	22.14	7.24		

*$p > .20$, N.S.

Table 5

Ancova Summary Table for Posttest Scores on KIPT -- T1-T5

Sources	SS	df	MS	F
Groups (adj.)	471.18	1	471.18	4.74*
Within (adj.)	2587.03	26	99.50	
Total (adj.)	3058.21	27		

*p <.05

Table of Means

Group	N	Pretest	Posttest	Adjusted Posttest
Treatment	14	35.79	49.07	47.18
Control	15	31.53	37.33	39.08

Table 6

Summary of Means, Variances, and Standard Deviations for Posttest Scores on KIPT (T1-T5)

	T_1		T_2		T_3		T_4		T_5	
	E	C	E	C	E	C	E	C	E	C
N	14	15	14	15	14	15	14	15	14	15
$\bar{X}$	6.93	6.13	7.57	3.47	8.43	6.67	11.64	10.6	14.5	10.47
S^2	18.78	9.18	24.96	14.38	34.67	29.56	40.37	6.57	23.39	22.25
S.D.	4.33	3.03	5.0	3.79	5.89	5.44	6.35	2.56	4.84	4.72

Table 7

t test for Significant Differences in Extreme Shifts of Two Levels or More on IRI Posttest

Group	N	Number Shifting	Percentage Shifting	t value for Difference
E	13	5	38%	2.13*
C	15	1	7%	

*$p < .05$

**t test procedure modeled after Smith (1962)

Smith, G.M. *A Simplified Guide to Statistics for Psychology and Education* (3rd ed.). New York: Holt, Rinehart, & Winston, 1962.

Table 8

t test for Differences in Percentage of Children with Upward Shifts to First Grade Plus on IRI Posttest Scores

Group	N	Number Shifting	Percentage of Shifts	t for Difference
E	13	8	62	1.98*
C	15	4	27	

*p <.05

Table 9

t test for Differences on Raw Scores on the Posttest Session of Gates-MacGinitie Scale

Group	N	$\bar{X}$	S.D.	df	t
E	11	20.64	7.28	26	.75*
C	14	23.00	7.80		

*p > .20, N.S.